

Making Holes in Sheet-Metal

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There are few radio/electronics projects that do not involve making holes in sheet aluminium, brass and plastics. For small round holes, up to perhaps 6 mm, ordinary "jobber" twist drills are usually adequate. Larger, and odd-shaped holes can be a little more tricky. Let me describe a few effective methods of tackling these.

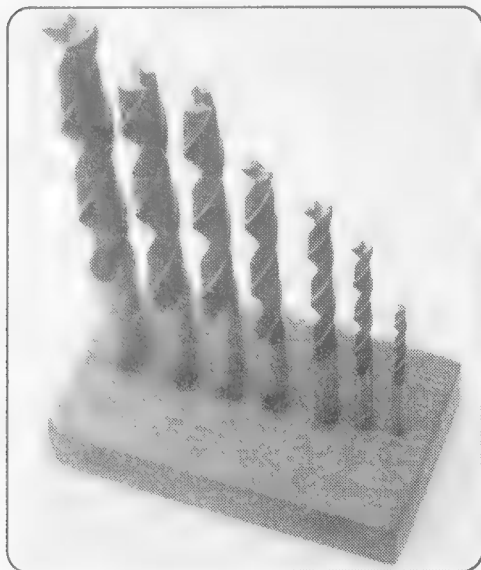


Photo 1: Brad-point drills

Before we go further, it is strongly recommended that the following power drilling operations be performed on a drill-press/bench-drill, with the job firmly clamped upon the drill-table to prevent movement. If you do not own, or have access to a drill-press, an ordinary hand-held variable-speed electric drill will serve. However, great care must be exercised so as not to over-load the motor. Always wear approved safety specs or goggles when using any kind of power tool- make it such a habit that you feel naked without them.

The job should be accurately marked-out with a scribe to show where all holes shall be. To prevent drill drift, a centre-punch indent must be applied exactly at the

intersection of the mark-out lines. To avoid error, it is good practice to note the final hole size adjacent to the mark.

When working with sheet-metals, less than say 2 mm thickness, holes larger than about 6 mm can turn out a bit raggedy, or we may get a triangular hole, even when the job is clamped firmly and backed with hard timber. The reason is that the drill point breaks through the material before the straight part of the drill has entered the work, so the point is free to wobble around- resulting in an irregular hole. One effective way of making nice round holes is to use 'pilot-point' or 'brad-point' drills (see Photo 1). The latter are intended for wood-working, but lend themselves very well to soft metals (such as aluminium) and plastics. In use, the pilot point enters the work first, which provides a stable pivot,



Photo 2: Hole punches

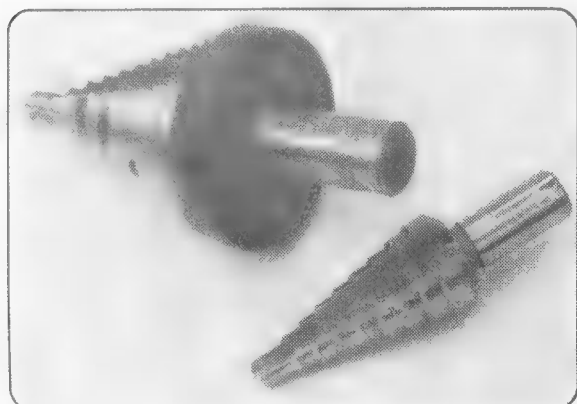
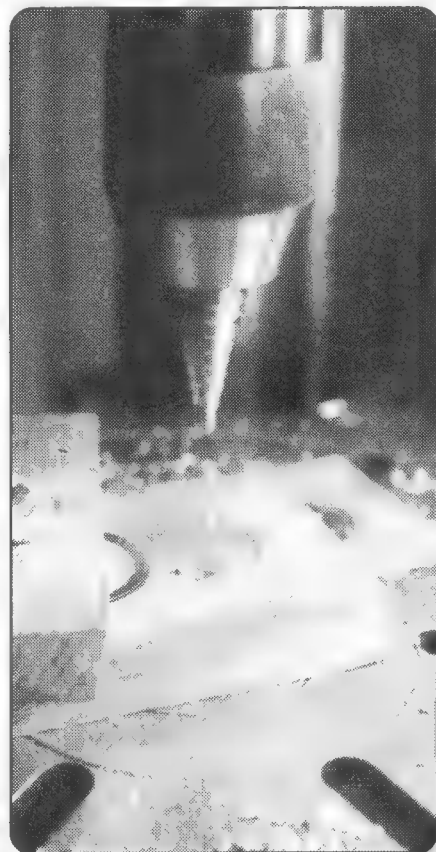


Photo 3: Step-drill bits

Photo 4: Step drilling



so that when the outer cutting edges enter, an accurate, round, and almost burr free hole is produced. Such tools permit holes with overlapping circumferences to be drilled, as will be described later (see also Refs 1 and 2).

One of the more traditional tools for making round holes is the "chassis-punch" or hole-punch (Photo 2). A pilot hole is drilled, then the guide-pin is inserted through the hole, and the punch is either struck with a hammer, or compressed in a vice. They make a clean round hole with very little burr. However, individual punches and punch sets are quite costly- when available.

Step-drill bits (Photo 3) are a relatively new idea. To ensure that the required step size is not exceeded, it is a good plan to mark- with felt-tipped pen, around the appropriate diameter upon the bit. A typical drilling operation is depicted in Photo 4. Note firm G-clamping and use of scrap wood blocks for protection of the drill table and the job. A similar tool is the 'cone-drill', which is used in a like manner.

An extremely useful tool is the tapered hand-reamer, pictured in Photo 5. Makes a clean hole with little burring. A hole slightly smaller in size is made first, then hand-reamed to exact final diameter, as depicted in Photo 6. Generally used as a follow-on after step or brad drilling, or round filing under-size. Incidentally, a de-burring tool may be fashioned from an old triangular file; grind the teeth off all three faces and fit into a file handle. The tool is inserted into a burred hole at about 45 degrees, where the burr may be shaved off.

When I was a lad with few tools, all my large holes were made using the good old "chain-of-holes" method, depicted in Photo 7. With care, a brad-drill may be applied inside the marked circumference so that their edges just touch, or overlap slightly. The waste is broken out, then the hole finished to required diameter with a half-round file.

A "nibbler" (Photo 8) is useful for making round- or any other shaped hole. I find that it is generally best to nibble about 1-2 mm inside the required dimension at first, then go round again, this time bringing the front of the blade right up to within "half a bee's dick" of the marked line (Photo 7), finishing off to exact size by filing.

We can probably thank electricians for making the hole-saw (Photo 9) so popular. The job must be firmly clamped upon the

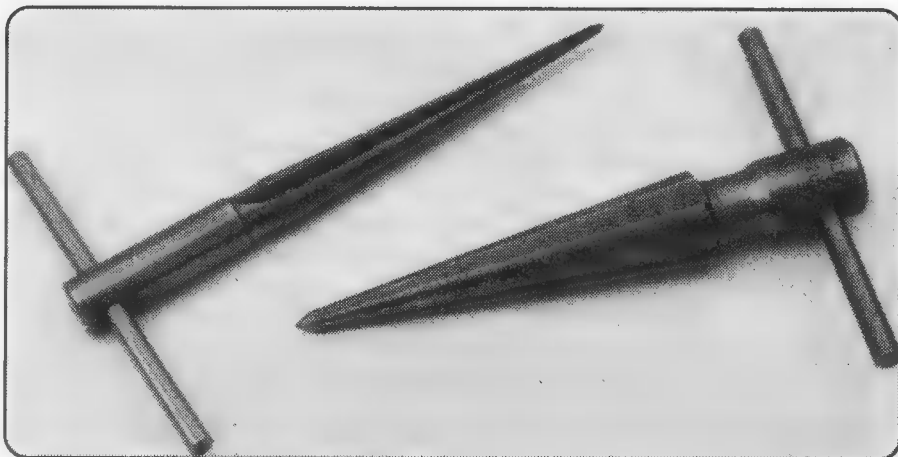


Photo 5: Hand-reamers

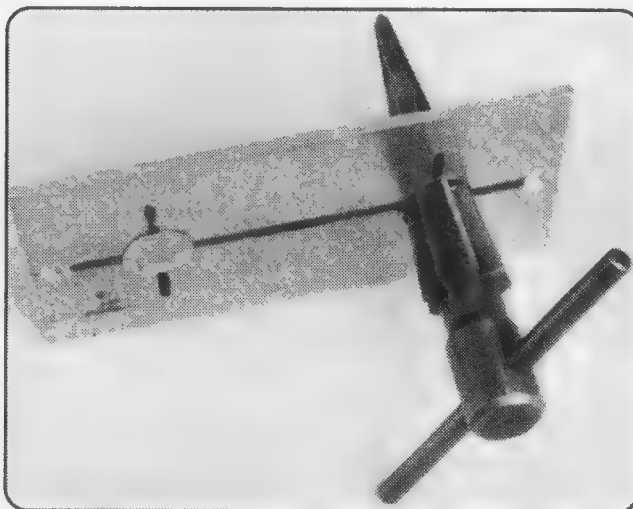


Photo 6: Hand-reamed hole

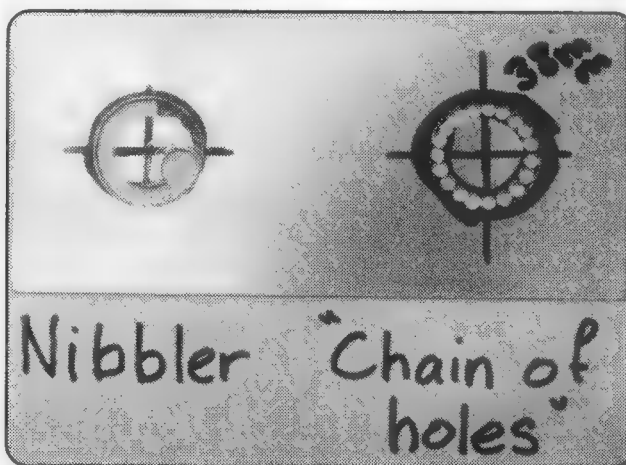


Photo 7

drill table, as depicted in Photo 10. Use slowest drill speed setting. A light oil lubricant, such as sewing-machine oil, or auto transmission fluid will aid things considerably. The resulting hole can be pretty raggedy, so a hole slightly under-size is to be preferred, which is then

cleaned up and brought to required size with a half-round file.

Lastly, may I introduce my little mate the "rod-saw". Fits into a standard hack-saw frame. A hole must first be drilled inside the waste to admit the blade lug. The saw is then plied in the usual way,

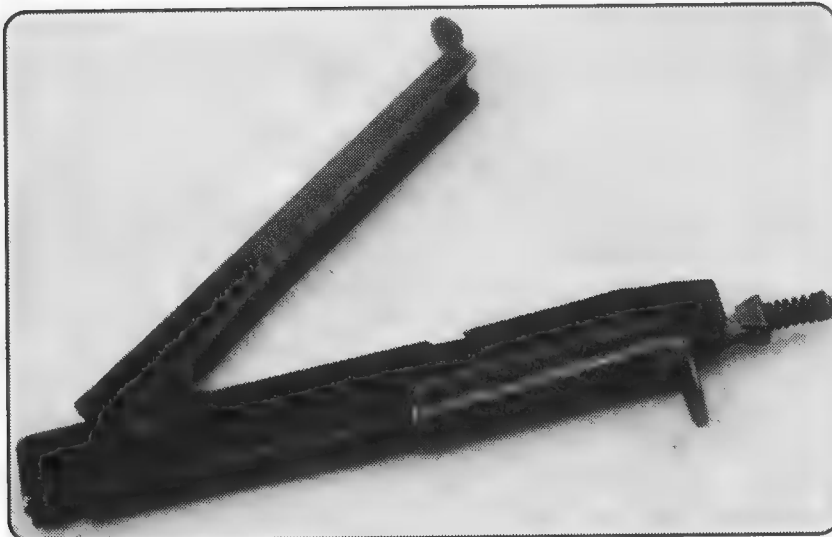


Photo 8: Hand-operated nibbler

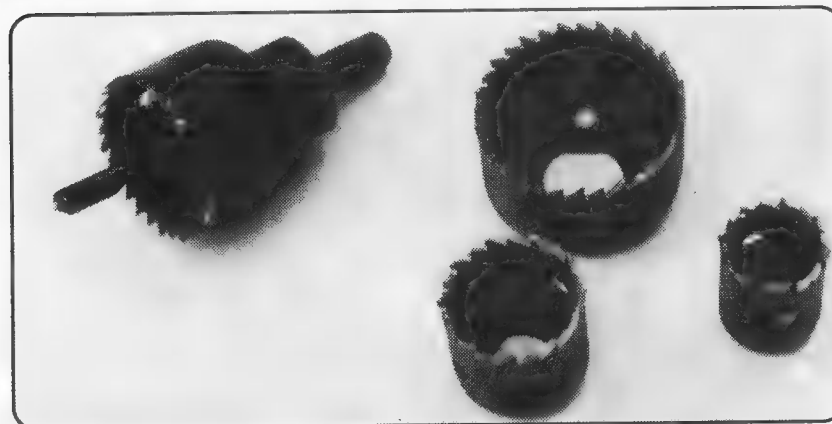


Photo 9: Hole saws



Photo 10

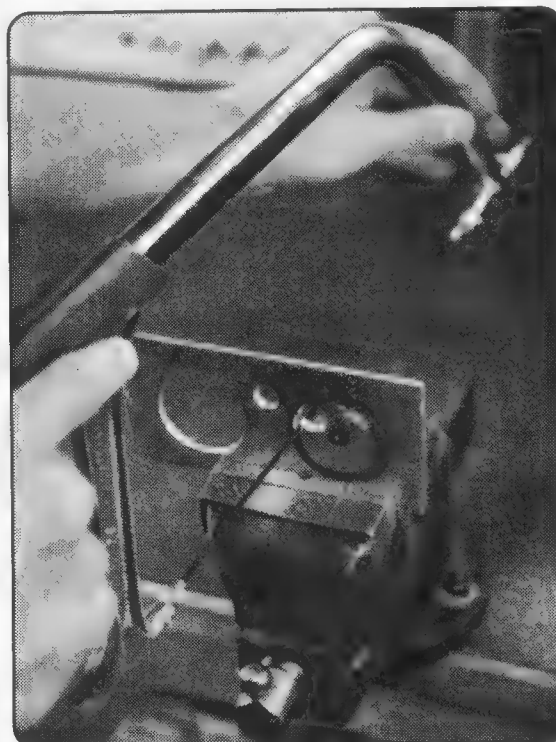


Photo 11: Rod-saw

as depicted in Photo 11. Clean up rough edges and bring to required size by filing.

Tool Suppliers Punches, step and cone drills, nibbler, hole-saws and tapered hand-reamers are generally available from suppliers to the electrical/electronics trade- for example; Radio Parts (03 9329 7888), Radio Spares (1300 656 636), Farnell (02 9645 8888), Jaycar and Dick Smith Electronics. Brad-drills, hole-saws and rod-saws available from many hardware suppliers and general tool merchants. In addition, for Melbourneans, try; Gordon Franklin (tool merchant; 03 9887 8204) and Wantirna Sunday Morning Market (cnr Boronia Rd & Mountain Hwy, Wantirna). For mail-order, try McJing Tools (02 9789 3851)- catalogue available.

References and Further Reading

1. "Modified Twist Drills for Sheet Metal"; Diamond, AR July '95.
2. "Sheet Metal Drills"; Smith, Model Engineer issues #3851 and # 3853.
3. "Large Holes in Sheet Metal"; White, G3SEK, Rad Com Oct '93.
4. Model Engineering- A Foundation Course; P. Wright. Nexus Books, pp 225, 226 (excellent book- also applicable to radio/electronics metal-work operations).